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UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

Ex parte UCHENNA OFOMA and BART DEAN HIBBS[1]

Appeal 2016-000788
Application 13/220,329
Technology Center 2800

Before JAMES C. HOUSEL, CHRISTOPHER C. KENNEDY, and DEBRA L. DENNETT, *Administrative Patent Judges*.

KENNEDY, *Administrative Patent Judge*.

DECISION ON APPEAL

This is an appeal under 35 U.S.C. § 134(a) from the Examiner's decision to reject claims 1–3, 5–16, 28, and 29. We have jurisdiction under 35 U.S.C. § 6(b).

We AFFIRM-IN-PART.

BACKGROUND

The subject matter on appeal relates to systems for managing heat to improve cooling of electronics within equipment bays for aircraft. *E.g.*,

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[1] According to the Appellants, the real party in interest is Aerovironment, Inc. App. Br. 2.

Spec. ¶ 1; Claim 1. Claim 1 is reproduced below from page 18 (Claims Appendix) of the Appeal Brief:

1. A system for managing heat transfer comprising:

a cavity having an inner wall portion;

at least one heat-generating component disposed within the cavity; and

a plurality of heat conducting members disposed adjacent one another, each heat conducting member comprising:

a resilient core; and

an outer shell wrapped around at least a portion of the resilient core, the outer shell comprising a material having a relatively high thermal conductivity,

wherein the plurality of heat conducting members are positioned between the heat-generating component and the inner wall portion of the cavity and the outer shells of the heat conducting members are in physical contact with each other in order to provide improved heat transfer characteristics of the heat conducting members to transfer heat away from the heat-generating component.

REJECTIONS ON APPEAL

1. Claims 1, 6, and 9–12 stand rejected under 35 U.S.C. § 103(a) as unpatentable over Barker et al. (US 5,175,613, issued Dec. 29, 1992) in view of Dietrich et al. (US 7,470,866 B2, issued Dec. 30, 2008) and Yu et al. (US 7,492,599 B1, issued Feb. 17, 2009).

2. Claims 2 and 3 stand rejected under 35 U.S.C. § 103(a) as unpatentable over Barker in view of Dietrich and Yu, further in view of Corti et al. (US 2005/0017350 A1, published Jan. 27, 2005).

3. Claims 5 and 8 stand rejected under 35 U.S.C. § 103(a) as unpatentable over Barker in view of Dietrich and Yu, further in view of Sarno et al. (US 2002/0172010 A1, published Nov. 21, 2002).

4. Claim 7 stands rejected under 35 U.S.C. § 103(a) as unpatentable over Barker in view of Dietrich and Yu, further in view of Kim (US 6,653,556 B2, issued Nov. 25, 2003).

5. Claims 13–16 stand rejected under 35 U.S.C. § 103(a) as unpatentable over Barker in view of Dietrich, Yu, Corti, and Sarno.

6. Claim 28 stands rejected under 35 U.S.C. § 103(a) as unpatentable over Sarno in view of Fehlmann (US 4,139,670, issued Feb. 13, 1979).

7. Claim 29 stands rejected under 35 U.S.C. § 103(a) as unpatentable over Sarno in view of Fehlmann and Fust (US 2001/0002528 A1, published June 7, 2001).

ANALYSIS

The Appellants present several arguments in opposition to the Examiner's rejections. We address those arguments below. All arguments not raised in the Appeal Brief are deemed to be waived absent a showing of good cause. *See* 37 C.F.R. § 41.41(b)(2); *cf. In re Jung*, 637 F.3d 1356, 1365 (Fed. Cir. 2011) (explaining that, even if the examiner had failed to make a prima facie case, the Board would not have erred in framing the issue as one of reversible error because "it has long been the Board's practice to require an applicant to identify the alleged error in the examiner's rejections"). For reasons set forth below, we determine that the Appellants have not identified reversible error in Rejections 1–5. Accordingly, we affirm those rejections for reasons set forth below, in the Final Action, and

in the Examiner's Answer. *See generally* Final Act. 2–22; Ans. 3–14. However, as discussed below, we reverse as to Rejections 6 and 7.

Rejection 1

The Appellants present arguments concerning limitations that appear in claim 1. Claims 6 and 9–12 will stand or fall with claim 1.

The Examiner finds that Barker teaches each element of claim 1, including a heat conducting member, but that Barker does not disclose (1) that the heat conducting member comprises a resilient core, (2) an outer shell wrapped around at least a portion of the resilient core, or (3) a plurality of heat conducting members that are in contact with each other. Final Act. 2–3.

Concerning (1) the resilient core and (2) the outer shell, the Examiner finds that Dietrich discloses a heat conducting member comprising a resilient core and an outer shell wrapped around at least a portion of the resilient core. *Id.* at 3. The Examiner acknowledges that Dietrich teaches electrically conductive materials but finds that "[e]lectrically conductive materials generally have a relatively high thermal conductivity," and that a person of ordinary skill therefore would have understood Dietrich's outer shell to have relatively high thermal conductivity, as claimed. *Id.* The Examiner concludes that it would have been obvious to substitute Barker's heat conducting cushions with the heat conducting members of Dietrich "in order to provide a thermally and/or electrically conductive seal between the heat-generating component(s) and the inner wall portion of the cavity." *Id.*

Concerning (3) the plurality of heat conducting members in contact with each other, the Examiner finds that Yu discloses two heat conducting members wherein the outer shells are in physical contact with each other.

Id. at 4. The Examiner finds that "[p]lacing the heat conducting members in direct physical contact (and therefore thermal contact) with each other would generally homogenize the distribution of heat between them." *Id.* The Examiner concludes that it would have been obvious in view of Yu to utilize a plurality of heat conducting members that are in contact with each other "in order to homogenize the distribution of heat between the heat conducting members." *Id.*

In view of those and other findings, the Examiner concludes that the subject matter of claim 1 would have been obvious in view of the prior art. *Id.* at 2–4.

We address the Appellants' challenges to the Examiner's reasoning below. In addition, we note that the Appellants do not challenge the prior art status of any reference relied upon by the Examiner or argue that a person of ordinary skill in the art would not have been aware of the references relied upon by the Examiner.

1. The Appellants argue that the Examiner's analysis is conclusory and fails to provide any supporting rationale for the proposed modifications to Barker. *See* App. Br. 8–9, 12 (citing *In re Kotzab*, 55 USPQ2d 1313 (Fed. Cir. 2000)). We disagree. As set forth above, the Examiner expressly provides a rationale for each proposed modification. *See* Final Act. 2–4; *cf. Jung*, 637 F.3d at 1365.

2. The Appellants argue that Barker's heat sink, not the cushion relied upon by the Examiner, transfers heat away from Barker's heat-generating component. App. Br. 10; *see also* Barker Fig. 2 (depicting thermally conductive cushion 52 and heat sink 14). They conclude that, "because the feature that transfers heat away from the chips 24 in Barker is the heat sink

14, and the gasket assembly 110 of Dietrich [i.e., what the Examiner relies on as Dietrich's heat conducting member] is for electrical conduction, not heat, Applicant submits that one skilled in the art would not be motivated to combine the teachings of Dietrich with Barker." App. Br. 10.

We are not persuaded by this argument. Barker's cushions are described as "thermally conductive compliant cushions" and "insure[] that good thermal contact will be made between chips 24 and heat sink 14." Barker at 3:33–41. It is clear, contrary to the Appellants' assertions and as explained by the Examiner, *see* Ans. 5, that Barker's cushions and heat sink work together to transfer heat away from the chips. *Cf.* App. Br. 12 (conceding that Barker's cushion 52 "is intended to function for . . . thermal contact.").

Concerning Dietrich's gasket assemblies 110, the Appellants do not acknowledge or persuasively challenge the Examiner's determination that a person of ordinary skill would have understood them to be suitable for thermal conduction, notwithstanding the fact that they are also taught as being electrically conductive. *See* Final Act. 3; Ans. 5–6. On this record, we have no persuasive basis to reject that finding.

Accordingly, the Appellants' conclusion that a person of ordinary skill in the art would not have been motivated to combine Dietrich with Barker is based on factual assertions that do not support the conclusion drawn by the Appellants. In that regard, we note that, on this record, the Examiner's proposed modification is simply the substitution of one known heat conducting member for another. Such substitutions typically do not result in nonobvious subject matter. The Appellants' arguments do not persuade us otherwise in this case. *See KSR Int'l Co. v. Teleflex Inc.*, 550 U.S. 398, 416–

21 (2007) ("The combination of familiar elements according to known methods is likely to be obvious when it does no more than yield predictable results."); *see also id.* at 416 ("[W]hen a patent claims a structure already known in the prior art that is altered by the mere substitution of one element for another known in the field, the combination must do more than yield a predictable result."); *cf. Jung*, 637 F.3d at 1365.

3. The Appellants argue that, "[e]ven if Barker were modified as suggested in the Final Office action, such a modification would draw heat in an opposite direction from that which Barker is trying to achieve . . . which would change the operation of Barker." App. Br. 10 (emphasis in original). We are not persuaded by that argument because it is not supported by evidence or persuasive technical reasoning. *See In re Pearson*, 494 F.2d 1399, 1405 (CCPA 1974) ("Attorney's argument in a brief cannot take the place of evidence."). If Barker's thermally conductive cushions were replaced by the heat conducting elements of Dietrich, it is unclear how or why that modification would change the direction of heat flow. It appears that the heat would continue to flow through the heat conducting element from the heat generating component to the heat sink.

4. The Appellants argue that "Barker already employs a heat sink 14 in order to dissipate heat from its chips 24, and thus one skilled in the art would not look to the teachings of Dietrich, or any other art of record, in order to provide improved heat transfer characteristics." App. Br. 11.

We are not persuaded by that argument. As noted above, the proposed rationale is the substitution of one known heat conducting element for another. Such substitutions typically do not result in nonobvious subject matter. *See KSR*, 550 U.S. at 416–21. Moreover, the Examiner finds

motivation to combine in Dietrich's teaching of a "seal" and the benefit that a conductive seal would provide to Barker. *See* Final Act. 3; *see also Dystar Textilfarben GmbH & Co. Deutschland KG v. C.H. Patrick*, 464 F.3d 1356, 1368 (Fed. Cir. 2006) ("[T]he desire to enhance commercial opportunities by improving a product or process is universal—and even common-sensical . . . ."). The Appellants do not meaningfully challenge, or otherwise identify reversible error in, the Examiner's findings in that regard. *Cf. Jung*, 637 F.3d at 1365.

5. The Appellants argue that "Barker includes a sealed area 38 for the chips 24, and the Examiner has not explained how a plurality of modified gasket assemblies 110 of Dietrich (being in physical contact with each other as allegedly taught by Yu) would be configured within this area 38, and moreover on top of an extremely small chip 24." App. Br. 11.

That argument is not persuasive. "The test for obviousness is not whether the features of a secondary reference may be bodily incorporated into the structure of the primary reference . . . . Rather, the test is what the combined teachings of the references would have suggested to those of ordinary skill in the art." *See In re Keller*, 642 F.2d 413, 425 (CCPA 1981). The Appellants do not allege that modifying Barker's heat conducting cushions to include a resilient core and outer shell, as taught or suggested by Dietrich, would have been beyond the ordinary level of skill in the art. Nor do the Appellants allege that employing a plurality of such elements in contact with each other would have been beyond the ordinary level of skill in the art or otherwise incompatible with Barker. "It is well settled that the mere duplication of parts has no patentable significance unless a new and

unexpected result is produced." *In re Harza*, 274 F.2d 669, 671 (CCPA 1960).

In the Answer, the Examiner provides further explanation as to how the references could be combined. *See* Ans. 7. The Appellants do not meaningfully address or dispute the Examiner's reasoning in the Reply Brief.

On this record, the Appellants' argument concerning how the physical modification would be carried out does not persuade us of reversible error in the Examiner's rejection. *Cf. Jung*, 637 F.3d at 1365.

6. The Appellants argue that, because the portion of Dietrich cited by the Examiner as corresponding to the claimed outer shell is described by Dietrich as a "plated fabric," it "would reduce the effectiveness of the 'cushion' 52 of Barker, which is intended to function for both thermal contact and to reduce mechanical shock."

We are not persuaded by that argument because it is not supported by evidence or persuasive technical reasoning. *See Pearson*, 494 F.2d at 1405 ("Attorney's argument in a brief cannot take the place of evidence."). Similar to the Appellants' Specification, *see* Spec. ¶ 30, Dietrich teaches that the core 112 of its heat conducting member may be made of foam, Dietrich at 5:46–50. It teaches that the outer shell may be made, for example, of plated fabric, plated plastic, electrically conductive coated rubber, electrically conductive foil, electrically conductive woven wire, or electrically conductive wire mesh. Dietrich at 6:32–52. The Appellants provide no evidence or persuasive technical reasoning to show that those materials would have reduced thermal or mechanical performance relative to Barker's cushion 52 such that a person of ordinary skill would have been

dissuaded from combining the references as proposed by the Examiner. Even assuming, *arguendo*, that the differing materials would have been expected to produce somewhat different thermal or mechanical performance, a person of ordinary skill in the art would have been capable of understanding those differences and selecting an appropriate material for the desired application. *Cf. Winner Int'l Royalty Corp. v. Wang*, 202 F.3d 1340, 1349 n.8 (Fed. Cir. 2000) ("The fact that the motivating benefit comes at the expense of another benefit . . . should not nullify its use as a basis to modify the disclosure of one reference with the teachings of another. Instead, the benefits, both lost and gained, should be weighed against one another.").

7. In the Reply Brief, the Appellants raise new arguments concerning the Examiner's reliance on Dietrich for the disclosure of a heat conducting member comprising a resilient core and a thermally conductive outer shell. *See* Reply Br. 2–3 (discussing, e.g., "electrical shorting of the wiring board"). Those arguments are untimely because the Final Action expressly relies on Dietrich's disclosure of electrically conductive materials. *See* Final Act. 2–3; *see also* 37 C.F.R. § 41.41(b)(2). We decline to consider the new arguments because the Appellants have not established good cause for failing to present those arguments in the opening Appeal Brief. *See* 37 C.F.R. § 41.41(b)(2).

* * *

In summary, we have carefully considered the Appellants' arguments concerning claim 1, and we are not persuaded of reversible error in the rejection. We affirm the rejection of claim 1.

Rejection 2

Claim 2 depends from claim 1 and further comprises "a copper layer disposed over the heat conducting members proximate the inner wall portion." Claim 3 depends from claim 2 and further comprises "a pressure-sensitive adhesive (PSA) layer disposed over the copper layer and in contact with the inner wall portion to secure the heat conducting members and the copper layer to the cavity."

The Examiner determines that Corti "discloses that it is known to use a copper layer 96 . . . and pressure-sensitive adhesive layer 98 to connect a heat conducting member 94 to the inner surface of a housing 93." Final Act. 5. The Examiner concludes that it would have been obvious to combine Corti with Barker, Dietrich, and Yu "in order to securely adhere the heat conducting members to the inner wall portion of the cavity, and form a thermally conductive path between the heat conducting members and the inner wall portion of the cavity." *Id.* at 6.

The Appellants argue that Corti "merely describes a bonded metal strip 96, with no mention of copper or the function of this strip," and that Cori "lacks any disclosure of a pressure sensitive adhesive (PSA)." App. Br. 13 (emphasis in original).

For reasons aptly stated by the Examiner, *see* Ans. 8, which we will not repeat here, we agree with the Examiner that Corti teaches or suggests that the bonded metal strip may be copper and that the adhesive may be pressure sensitive. *See, e.g.*, Corti at Abstract, ¶¶ 17, 41, claims 1 and 3. We affirm the Examiner's rejection of claims 2 and 3. *See* Ans. 8; *cf. also In re Lovin*, 652 F.3d 1349, 1357 (Fed. Cir. 2011) ("a mere recitation of the claim elements and a naked assertion that the corresponding elements were

not found in the prior art" is unpersuasive); *Jung*, 637 F.3d at 1365.

Rejection 3

Claim 5 depends from claim 1 and further recites "wherein the outer shells comprise at least one sheet of pyrolytic graphite sheet (PGS) material." Claim 8 depends from claim 1 and further comprises "at least one thermally conductive element disposed between the heat conducting members and the heat-generating component."

Concerning claim 5, the Appellants argue only that the Examiner fails to provide an "explicit rationale" to support the conclusion of obviousness. App. Br. 13.

We disagree. The Examiner finds that Sarno "discloses that pyrolytic graphite possesses a thermal conductivity greater than copper." Final Act. 6. The Examiner concludes that it would have been obvious to from the outer shells from PGS "in order to provide the outer shells with high thermal conductivity." *Id.* at 7. The Examiner additionally determines that using PGS for the outer shells would have been nothing more than the use of a known material according to its established function. *Id.* The Examiner's rationale is supported by the Examiner's citations to the record. The Appellants do not challenge any of the Examiner's specific findings. We affirm the rejection. *Cf. Jung*, 637 F.3d at 1365.

The Appellants do not raise separate arguments concerning claim 8. Because it depends from claim 1, the rejection of which we affirm above, we likewise affirm the Examiner's rejection of claim 8.

Rejection 4

Claim 7 depends from claim 1, the rejection of which we affirm above. Because the Appellants raise no separate arguments concerning claim 7, we likewise affirm the Examiner's rejection of claim 7.

Rejection 5

Concerning claim 13, the Appellants argue, with no elaboration, that the Examiner has not provided an explicit rationale for combining the references. App. Br. 14. We disagree. The Examiner expressly provides a rationale for the proposed modifications involving each reference. *See* Final Act. 9–12. We affirm the rejection of claim 13. *Cf. Jung*, 637 F.3d at 1365.

Claims 14 and 15 depend from claim 13. The Appellants raise no separate arguments for those claims. We affirm the Examiner's rejection of claims 14 and 15.

Claim 16 depends from claim 13 and further recites "wherein the sealed cavity is an aircraft equipment bay." The Examiner finds that Sarno "teaches that modular electronic devices, e.g., housed cavities containing heat-generating electronic devices and heat conducting members (Fig. 3), may be used for aircraft electronic modules." Final Act. 13. The Examiner concludes that it would have been obvious to use the system rendered obvious by the prior art in an aircraft equipment bay "in order to dissipate heat from an aircraft equipment bay." *Id.*

The Appellants do not dispute the Examiner's findings concerning Sarno but argue that Sarno does not explicitly mention "aircraft equipment bays," and that the Examiner's rejection "is yet another conclusory statement that does not even arrive at the claimed invention." App. Br. 14–15.

We are not persuaded by that argument. *Cf. Lovin*, 652 F.3d at 1357. The Appellants provide no basis to believe that a person of ordinary skill in the art would not have been motivated to use the cooling systems rendered obvious by the prior art in any appropriate application. In view of Sarno's teaching of "electronic modules on board aircraft," *e.g.*, Sarno at Abstract, a person of ordinary skill in the art would have immediately envisaged aircraft equipment bays or otherwise understood that "electronic modules on board aircraft" are located in equipment bays, notwithstanding the fact that Sarno does not *ipsis verbis* use the term "aircraft equipment bay."

We affirm the Examiner's rejection of claim 16.

Rejection 6

Claim 28 recites:

28. A system for managing heat transfer comprising:

a cavity having an inner wall portion;

at least one heat-generating component disposed within the cavity; and a plurality of heat conducting members disposed adjacent one another, each heat conducting member comprising:

a resilient core; and

an outer shell wrapped around at least a portion of the resilient core, the outer shell comprising a material having a relatively high thermal conductivity,

wherein the plurality of heat conducting members are positioned between the heat-generating component and the inner wall portion of the cavity;

a structural member disposed proximate the inner wall portion of the cavity and comprising:

an upper skin;

a lower skin; and

> a foam core disposed between the upper skin and the lower skin;
>
> at least one heat conducting array extending through the foam core and between the upper skin and the lower skin, the heat conducting array defining at least one upper cap, at least one lower cap, and a wall portion extending between the upper cap and the lower cap, the upper cap being disposed proximate a heat source; and
>
> a heat conducting spreader disposed between the lower cap of the heat conducting array and the lower skin of the structural member,
>
> wherein the heat conducting array dissipates heat from the heat-generating component by transferring heat from the at least one upper cap, through the wall portion, to the at least one lower cap, to the heat conducting spreader, through the lower skin, and out to an atmosphere.

The Examiner finds that Sarno discloses a system similar to that of claim 28 but that Sarno does not disclose the structural member, the heat conducting array, or the heat conducting spreader. Final Act. 14–15. The Examiner finds that Fehlmann discloses a structural member, a heat conducting array, and a heat conducting spreader that meet the limitations of claim 28. *Id.* at 15–16. The Examiner determines that it would have been obvious to modify the system of Sarno with the structural member of Fehlmann in order to reinforce the inner wall portion of Sarno. *Id.* at 16–17.

For reasons consistent with those argued by the Appellants, *see* App. Br. 14, 17, we are not persuaded by the Examiner's rationale. Sarno is concerned with heat dissipation and cooling, but the Examiner finds that Fehlmann's structural member includes "insulating" elements. *See* Final Act. 16. A person of ordinary skill would have understood that Fehlmann's insulating elements would hinder Sarno's stated goal of "improv[ing] the

cooling of electronic modules." Sarno at Abstract. Moreover, the Examiner finds motivation to combine the references in alleged structural reinforcement of Sarno's inner wall portion, but the Examiner does not persuasively identify any indication in Sarno that reinforcement of Sarno's inner wall portion is necessary or desirable. *See* Final Act. 16–17.

On this record, we are not persuaded that the Examiner has carried the Examiner's burden of showing by a preponderance of the evidence that a person of ordinary skill in the art would have been motivated to combine Fehlmann with Sarno to achieve the system of claim 28.

Rejection 7

Claim 29 includes limitations similar to those of claim 28, including "a structural member." The Examiner's analysis of claim 29 does not remedy the errors identified above with respect to claim 28. Accordingly, we also reverse the Examiner's rejection of claim 29.

CONCLUSION

We AFFIRM the Examiner's rejections of claims 1–3 and 5–16.

We REVERSE the Examiner's rejections of claims 28 and 29.

No time period for taking any subsequent action in connection with this appeal may be extended under 37 C.F.R. § 1.136(a).

AFFIRMED-IN-PART